Remarks

The present Amendment is in response to the Office Action mailed on February 21, 2006. **A petition and fee for a two-month extension of the three-month shortened statutory deadline for response to July 21, 2006 are enclosed. Also enclosed is a Supplemental Information Disclosure Statement, form 1449, and replacement copy of the Qin article as discussed below.** The Office Action rejected claims 1-3, 7-8, 10-11, 19, and 22-25 under 35 U.S.C. § 102(b) as assertedly being anticipated by the Katz U.S. Patent No. 6,403,397 ("Katz"). The Office Action also rejected claims 4-6, 9, 2-13 and 21 under 35 U.S.C. § 103(a) as assertedly being obvious over Katz in view of Klauk, H. et al., "High-Mobility Polymer Gate Dielectric Pentacene Thin Film Transistors", Journal of Applied Physics, Vol. 92, No. 9, pp. 5259-5263 (Nov. 1, 2002) ("Klauk"); and further in view of Mushrush, M. et al., "Easily Processable Phenylene-Thiophene-Based Organic Field-Effect Transistors and Solution-Fabricated Nonvolatile Transistor Memory Elements", Journal American Chemical Society, Vol. 125, No. 31, pp. 9414-9423 (2003) ("Mushrush"). The Office Action also rejected claim 26 under 35 U.S.C. § 103(a) as assertedly being obvious over Katz in view of Katz et al., "Synthesis, Solubility, and Field-Effect Mobility of Elongated and Oxa-Substituted αω-Dialkyl Thiophene Oligomers. Extension of "Polar Intermediate" Synthetic Strategy and Solution Deposition on Transistor Substrates", Chem. Mater. Vol. 10, pp. 633-638 (American Chemical Society 1998) ("Katz Article"). Claims 1, 9 and 19 have been amended to be more clear and distinct. Claims 14-18 and 20 were previously cancelled, and claim 4 is now cancelled without prejudice. New claim 27 has been added. Claims 1-3, 5-13, 19, and 21-27 are presently pending.

Supplemental Information Disclosure Statement

The Office Action crossed out reference No. 3 as it was listed on the form PTO-1449 filed with the Information Disclosure Statement ("IDS") mailed on August 5, 2005. That reference is Qin et al., "Fabrication of Ordered Two-Dimensional Arrays of Micro- and Nanoparticles Using Patterned Self-Assembled Monolayers as Templates", Adv. Mater., Vol. 11, No. 17, pp. 1433-1437 (1999) ("Qin"). Counsel for Applicants confirmed in a telephone conversation with the Examiner that this reference was in fact received by the U.S. Patent & Trademark Office with the IDS but its scanning onto the PAIR System was subject to an internal delay. A Supplemental Information Disclosure Statement including an additional copy of Qin and a form PTO-1449 is nevertheless enclosed.

The Rejection Under 35 U.S.C. § 102(b)

Claims 1-3, 7-8, 10-11, 19, and 22-25 stand rejected under 35 U.S.C. § 102(b) as assertedly being anticipated by Katz. Applicants respectfully traverse this rejection and request that it now be withdrawn, in view of the amendments above and the discussion below.

Independent claims 1 and 19 have been amended to incorporate the limitations of claim 4. Accordingly, both of such claims now recite that the dielectric layer is formed from a precursor composition having a refractive index of at least about 1.52. Claim 1 as amended recites a semiconductor apparatus including, and claim 19 recites an integrated circuit including, a dielectric layer having a surface, a portion of the surface having exposed aromatic groups. The dielectric layer is formed from a precursor composition having a refractive index of at least about

1.52. A polycrystalline semiconductor layer including an organic semiconductor composition overlies and is in contact with the portion of the surface. The organic semiconductor composition includes a compound having a chain-like moiety, the chain-like moiety including a conjugated thiophene or phenyl group and having alkyl chains at ends of the chain-like moiety. The specification illustrates at page 9, line 14 through page 10, line, 2 that:

> The dielectric layers 130 and 230 are formed from an organic composition that comprises aromatic groups in order to provide compatibility with the semiconductor layers 140 and 260. ... In one embodiment, the dielectric layer has at least the polarizability of chlorobenzene in order to promote the wetting of the dielectric layer by the semiconductor in solution during semiconductor layer formation, discussed below. Polarizability of a material is proportional to its refractive index. The refractive index of chlorobenzene is about 1.52. Hence, aromatic compounds having a refractive index of at least about 1.52 desirably can be used. The refractive indices of m-cresol and methylnaphthalene, for example, are 1.54 and 1.61, respectively.

FIG. 1 of Katz schematically shows a semiconductor device having a top contact geometry. Formation of the semiconductor device generally involves depositing a semiconductor film 16 onto a dielectric surface 14. Katz, col. 2, lines 52-54. Katz' bottom contact geometry semiconductor device is shown in FIG. 2. In such a geometry, source and drain contacts 38 and 40 are formed onto a dielectric layer 34, with the semiconductor layer 36 being formed over at least a portion of the contacts 38 and 40 and over a portion of the dielectric layer 34. Katz, col. 2, line 64 through col. 3, line 4. Katz discloses at col. 3, lines 15-17, that: "Suitable dielectric

materials include silicon oxide, spin-on glass, and liquid-phase processable polymeric materials such as polyimides and poly(methacrylates)." Katz fails to disclose and fails to suggest, in FIGS. 1-2 or any portion of Katz to which the Office Action points, a dielectric layer formed from a precursor composition having a refractive index of at least about 1.52.

The Office Action acknowledges at page 5 that Katz "does not teach dielectric layer is formed from a precursor composition ... which has a refractive index of at least about 1.52...". Applicants agree, and further note that the Office Action has not pointed to any portion of Katz that discloses or suggests that a composition for a dielectric layer be selected of precursors having a refractive index of at least about 1.52.

Hence, Katz fails to disclose and fails to suggest, in FIGS. 1-2 or elsewhere in the portions discussed by the Office Action, a dielectric layer including a surface, a portion of the surface having exposed aromatic groups, the dielectric layer being formed from a precursor composition having a refractive index of at least about 1.52. Therefore Katz fails to disclose and fails to suggest independent claim 1 or claim 19 as amended. Claims 2, 3, 7-8, 10-11 and 22-25 all depend directly or indirectly from claim 1.

The Rejection of Claims 4-6, 9, 2-13 and 21 Under 35 U.S.C. § 103(a)

Claims 4-6, 9, 2-13 and 21 stand rejected under 35 U.S.C. § 103(a) as assertedly being obvious over Katz in view of Klauk and Mushrush. The limitations of claim 4 have been incorporated into independent claims 1 and 19 as discussed above; and claim 4 has been cancelled without prejudice. All of claims 5, 6, 9 and 2-13 depend directly or indirectly from claim 1; and claim 21 depends from claim 19, as discussed above. Applicants respectfully

traverse this rejection and request that it now be withdrawn, in view of the above amendments of the claims, the above discussion of Katz deemed repeated here, and the further discussion below.

Klauk discloses a pentacene organic thin film transistor including poly-4-vinylphenol-co-2-hydroxyethylmethacrylate as a gate dielectric layer. Klauk p. 5259, right column. Although Klauk discloses a poly-4-vinylphenol-co-2-hydroxyethylmethacrylate dielectric layer, the Office Action has not pointed to any portion of Klauk that discloses or suggests that a composition for forming a dielectric layer be selected of precursors having a refractive index of at least about 1.52. Furthermore, pentacene does not have chain-like moieties as required in the molecular structures of the semiconductor composition recited by claims 1 and 19. Hence, Klauk fails to disclose and fails to suggest, in any portion of Klauk to which the Office Action points, a semiconductor apparatus as recited by claim 1 including in combination, or an integrated circuit as recited by claim 19 including in combination:

> a dielectric layer comprising a surface, a portion of said surface having exposed aromatic groups, said dielectric layer being formed from a precursor composition having a refractive index of at least about 1.52; and

a polycrystalline semiconductor layer comprising an organic semiconductor composition overlying and in contact with said portion of said surface, said organic semiconductor composition comprising a compound comprising a chain-like moiety, the chain-like moiety comprising a conjugated thiophene or phenyl group and comprising alkyl chains at ends of the chain-like moiety.

Claims 5, 6, 9, and 2-13 all depend directly or indirectly from claim 1; and claim 21 depends from claim 19.

Mushrush discloses organic field-effect transistors including semiconductor films formed on silicon dioxide- and glass resin-coated substrates. The semiconductors disclosed include: 2,5-bis(4-n-hexylphenyl)thiophene; 5,5'-Bis(4-n-hexylphenyl)-2,2'-bithiophene (6PTTP6); 5,5"-Bis(4-n-hexylpheny- l)-2,2':5',2"-terthiophene (6PTTTP6); 5,5'"-Bis(4-n-hexylphenyl)-2,2':5',2":5",2'"-quaterthiophene (6PTTTTP6); 1,4-Bis[5-(4-n-hexylphenyl)-2-thienyl]benzene (6PTPTP6); 2,5-Bis[4(4'-n-hexylphenyl)phenyl]thiophene (6PPTPP6). Mushrush, p. 9414. Mushrush fails to disclose and fails to suggest at pages 9414 or 9416 or in any other portion to which the Office Action has pointed, a dielectric layer formed from a precursor composition having a refractive index of at least about 1.52. Therefore Mushrush fails to disclose and fails to suggest either of independent claims 1 and 19.

The Office Action attempts to substantiate a rejection of claims 4-6, 9, 2-13 and 21 under 35 U.S.C. § 103(a) by combining Katz, Klauk and Mushrush. Klauk discloses a poly-4-vinylphenol-co-2-hydroxyethylmethacrylate dielectric layer without any reference being made by

Klauk in any portion pointed out by the Office Action to a refractive index of precursors for making that dielectric layer and without any suggestion in any portion of Klauk pointed to by the Office Action to select precursors for a dielectric layer based on their having a refractive index of at least about 1.52. The Office Action also has not pointed out any portion of Klauk that discloses or suggests the use of the semiconductors including chain-like moieties as defined in independent claims 1 and 19. The Office Action has not pointed out any portion of Katz or Mushrush that discloses or suggests a dielectric layer formed from a precursor composition having a refractive index of at least about 1.52. There is no motivation outside of Applicants' patent application to transform Klauk's teaching of a pentacene layer on a poly-4-vinylphenol-co-2-hydroxyethylmethacrylate dielectric layer disclosed without any discussion of the refractive index of precursors for making that layer, into a suggestion to select dielectric layers formed from precursors having a refractive index of at least about 1.52 that is nowhere discussed in Klauk and then to form layers of semiconductors including alkyl side chains disclosed in Katz or Mushrush on such dielectric layers.

The Office Action cannot use Applicants' own specification in this manner to modify the teachings regarding dielectric layers in Katz or Mushrush, using Klauk in a manner that Klauk nowhere itself suggests, in order to ground this rejection of the claims. None of the three references discloses forming a composition for a dielectric layer based upon a selection of precursors for the dielectric layer having a refractive index of at least about 1.52.

In the interest of clarity of the record, Applicants expressly traverse the reference made at page 6 of the Office Action regarding the phrase "concentration of hydrogen". Neither of the independent claims 1 and 19 recites a hydrogen concentration. Despite Applicants' prior

objection to the use of the same unexplained phrase in the previous Office Action, no relevance of it has been articulated in this Office Action, either.

The Rejection of Claim 26 Under 35 U.S.C. § 103(a)

Claim 26 stands rejected under 35 U.S.C. § 103(a) as assertedly being obvious over Katz in view of the Katz Article. Claim 26 depends from claim 1. Applicants respectfully traverse this rejection and request that it now be withdrawn, in view of the above amendment of claim 1, the above discussion of Katz deemed repeated here, and the further discussion below.

The Katz Article discloses thin film transistors ("TFTs") formed by thermally growing silicon dioxide dielectric on n-doped silicon substrate "gates". For the bottom contact geometry, gold electrodes were photolithographically defined, and the semiconductor was deposited over the entire electrode/dielectric surface. For the top contact geometry, gold electrodes were defined after semiconductor deposition. Katz Article, p. 634, right column. The Katz Article further discloses that solutions of oligothiophenes in chlorobenzene or 1,2,4-trichlorobenzene were prepared for liquid-phase deposition on TFTs. The solutions were applied dropwise onto the substrates, and for films cast from chlorobenzene, the solvents were evaporated from the devices in a vacuum oven at three different oven temperatures. Katz Article, p. 637, right column.

The passage from page 637 of the Katz Article just summarized is cited by the Office Action at page 7. It does not, as asserted by the Office Action, teach a dielectric layer having the polarizability of chlorobenzene. Instead, that passage of the Katz Article relates to dissolving an oligothiophene semiconductor in chlorobenzene solvent which is then evaporated. Once the chlorobenzene solvent has evaporated, a semiconductor layer without the chlorobenzene – not a

dielectric layer – remains. Furthermore, the Office Action has not pointed to any portion of the Katz Article that discloses a dielectric layer as recited in independent claims 1 and 19 formed from a precursor composition having a refractive index of at least about 1.52. Applicants do not agree that there is any motivation outside Applicants' own disclosure for combining Katz and the Katz Article together. However, even assuming that these references are properly combined, the Office Action has not pointed to any portion of either reference that discloses a dielectric layer as recited in independent claims 1 and 19 formed from a precursor composition having a refractive index of at least about 1.52.

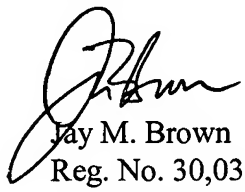
Response to Arguments

Contrary to the Office Action's assertions at page 8, not all polyimides are aromatic polymers. The term "imide" denotes the divalent radical –CONRCO-. Katz states "polyimides" at col. 3, line 17. The reference at col. 2, line 7 of Chen et al., U.S. Patent No. 6,863,936, purportedly cited by the Office Action as a definition of "polyimide", does not change the fact that some polyimides are aliphatic. The Office Action has not pointed to any portion of Katz that discloses an aromatic polyimide. Therefore Katz does not, in any portion pointed to by the Office Action, "clearly teach a dielectric layer (14) comprising a surface, a portion of said surface having exposed aromatic groups." The assertion by the Office Action that "polyimide is aromatic polymer" is a misleading overstatement, because polyimides can be either aromatic or aliphatic.

Conclusion

Since all of the pending claims, as amended, are not anticipated by and are unobvious over the cited references, Applicants believe that this application is now in order for allowance. The Examiner is respectfully requested and invited to contact the undersigned by telephone in order to resolve any remaining issues.

Respectfully submitted,



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